PASTER ROLLER

BACKGROUND OF THE INVENTION

The present invention relates to a technology for jointing a first web and a second web by pushing them in an overlapped state.

In a production line for a magnetic recording medium and other stripe bodies, a web made of plastic, paper, metal foil, etc. is extracted from the a roller. Then predetermined processes, such as coating, etc. are applied to the web.

In a related art, in order to exchange the web roller (old roller) from which the web is pulled out and whose remaining amount of the web becomes small for the unused web roller (new roller), and in order to stop the production line as few as possible, various technologies were proposed.

For example, in JP-A-11-91997, a paper jointing system is disclosed. The paper jointing system joints the rear end of the web wound on the old roller and the top end of the web wound on the new roller by overlapping them and pushing them by virtue of the brush.

Also, in JP-A-9-12185, the other conventional system is disclosed. The system joints the rear end of the web on the old roller for the magnetic recording medium and the top end

of the web on the new roller by pushing them by virtue of a paster roller (press roller or joint roller).

In this system, when the remaining amount of the web on the old roller is small, the new roller is rotated at a speed almost equal to that of to the older roller. Then, while sensing the position of an adhesive tape on the new roller by a sensor provided in vicinity of the new roller, the web of the old roller is pushed against the outer peripheral surface of the new roller at a predetermined timing by the paster roller. As a result, the top end of the web on the new roller can be jointed to the rear end of the web of the old roller via the adhesive tape on the new roller.

In the web jointing system, even when the web of the old roller is pushed against the outer peripheral surface of the new roller by the paster roller, there is a possibility that they are jointed insufficiently by the adhesive tape in some cases. If the jointing by the adhesive tape is insufficient, there are caused the disadvantages such that the web is broken down at the jointed location during the transportation of the web, etc.

Also, in the web jointing system in the related art, when the web of the old roller is pushed against the outer peripheral surface of the new roller by the paster roller, sometimes the web of the old roller is cut. Such cutting of the web causes the considerable reduction in production efficiency because

the production line must be stopped to fix it.

SUMMARY OF THE INVENTINON

The present invention has been made in view of the above circumstances, and an object of the present invention provides a paster roller that is capable of pushing the second web against the first web firmly and preventing the web cutting to contribute the improvement of the productivity.

The above object of the present invention can be achieved by providing a paster roller comprising: an air exhausting concave portion provided on an outer peripheral surface thereof for releasing an air between a first web and the outer peripheral surface, when the outer peripheral surface pushes the first web to a second web in their overlapped state.

Recently the thinning of the web such as the magnetic recording medium has been promoted. There is caused the case that, with such thinning of the web, the behavior of the web of the old roller becomes unstable by an air between the paster roller and the web of the old roller. That is, there is caused the case that the web of the old roller cannot be pushed uniformly against the outer peripheral surface of the new roller because of the influence of this air. In particular, it is found that, when the web carrying speed is high, there is such a tendency that the web of the old roller cannot be pushed uniformly against the outer peripheral surface of the

new roller.

If the above structure of the present invention is employed, an air exhausting concave portion can be provided on an outer peripheral surface of the paster roller. Therefore, when the paster roller is moved toward the web of the old roller by the air cylinder, etc., an air between the paster roller and the first web can be removed from the concave portion. In this manner, since the first web can be pushed uniformly against the second web by the paster roller, the first web and the second web can be pushed surely even if the web carrying speed is high, and thus the firm web jointing can be attained.

In this case, the advantages of the present invention become more remarkable if the web is thinner, and the advantages of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, preferably 7 μm or less. Also, the advantages of the present invention become more remarkable if the web carrying speed is relatively fast (e.g., 200 m/min or more).

Also, in the present invention, it is preferable that the spiral groove should be provided on the outer peripheral surface of the paster roller. Such groove can be formed by the simple machining and also can be easily cleaned during the use of the paster roller. It is preferable that the groove shape should be formed like the semi-circular shape or the circular arc shape in section, but the rectangular shape may

be employed. The groove shape is not particularly limited. A groove pitch can be set to 1 to 10 mm, for example. A groove depth can be set to 0.1 to 1 mm, for example.

In addition, in the present invention, it is preferable that the paster roller should be constructed to have a core bar and a coated elastic body provided on the outer peripheral surface of the core bar. As the material of the coated elastic body, the resin such as the rubber may be employed, for example. The web supplying system (the web jointing system) into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which the old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which the new roller is installed, and the paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and an air exhausting concave portion is provided on the outer peripheral surface of the paster roller. The web supplying system can joint the rear end of the web of the old roller and the top end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

The above object of the present invention can be achieved by providing a paster roller comprising: chamfered portions formed at both end portions of an outer peripheral surface

thereof.

Here, it is preferable that the chamfered portions should contain portions of the outer peripheral surface of the paster roller that are opposed to portions in the range from 20 mm to 50 mm from both end portions of the web, which contacts to the outer peripheral surface of the paster roller, in the width direction. In addition, the chamfered portion includes a flat portion that is inclined at a predetermined inclination angle or as the curved surface in a sectional view. At this time, the inclination angle relative to the center axis of the paster roller should be set preferably to 3° or more and 20° or less, and more preferably to 5° or more and 15° or less. In particular, 8° or more and 12° or less is preferable.

Also, the connected portion between the chamfered portion and other portions on the outer peripheral surface of the paster roller may be constructed to form the edge or to be connected smoothly without the edge.

An substantially cylindrical core bar or an substantially column core bar can be employed as the core bar, for example. The aluminum, etc. can be exemplified as the material of the core bar, but the material of the core bar is not particularly limited to this.

The resin such as the rubber can be employed as the material of the coated elastic body. It is preferable that the coated elastic body should have the hardness (HsA) in the

range from 40 to 70, which is measured by the spring type hardness test (A type) defined in JIS (Japanese Industrial Standard) K6301. Also, HsA should be set higher if the web carrying speed is high.

As the result of the earnest examination made by the inventors of the present invention, it is found that the above cutting of the web is caused bent paster roller. Namely, since the paster roller is bent when the paster roller is pushed against the outer peripheral surface of the new roller via the web of the old roller, both end portions of the paster roller in the axial direction impacts strongly against the web of the old roller. This is because that the cylinders provided near both end portions of the paster roller, or the like are operated, when the paster roller is pushed against the web of the old roller, and therefore the bending moment becomes maximum in the center of the paster roller.

According to the above structure of the present invention, the pushing force acting to both end portions of the web in the width direction can be reduced, when the paster roller pushes against the web and thus the web is pushed over the entire range in the width direction by the substantially uniform pushing force. It is caused that both end portions of the paster roller in the axial direction, which impact strongly against the web, are chamfered. Therefore, even if the paster roller is pushed against the web of the old roller, both end

portions in the axial direction never hit strongly against the web of the old roller and thus the cutting of the web can be prevented without fail. In this manner, the improvement of the productivity can be achieved.

In this case, the advantages of the present invention become more remarkable if the web is thinner. The web- cutting preventing effect of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, particularly 7 μm or less.

The web supplying system into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which an old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which a new roller is installed, and a paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and both end portions of the outer peripheral surface of the paster roller are chamfered. The web supplying system can joint the rear end of the web of the old roller and the top end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

The above object of the present invention can be achieved by providing a paster roller for pushing the first web and the

second web in their overlapped state, wherein the paster roller is formed as a predetermined crown shape. For examination, the predetermined crown shape is defined by rotating a bus-line having an inclination or curve the height of which is changed by from 0.5 mm to 2.5 mm at a position 1000 mm apart therefrom.

The crown shape signifies that the outer peripheral shape of the pushing portion of the paster roller, that pushes against the first and second webs, is formed as a barrel shape having a predetermined crown (a difference between an outer peripheral diameter of the center portion of the pushing portion and an outer peripheral diameter of both end portions in the axial direction). That is, this crown shape means such a shape that the pushing portion of the paster roller has the maximum outer peripheral diameter in the center portion in the axial direction, and the outer peripheral diameter is reduced gradually from the center portion to both end portions in the axial direction, and the outer peripheral diameter becomes minimum in both end portions in the axial direction.

It is preferable that a range of 0.5 mm or more and 2.5 mm or less per a width 1000 mm of the paster roller should be selected as the crown.

The pushing portion of the paster roller is constructed to have the core bar and the coated elastic body provided on the outer peripheral surface of the core bar, but is not limited to this structure.

The substantially cylindrical core bar or the substantially column core bar can be employed as the core bar, for example. The aluminum, etc. can be exemplified as the material of the core bar, but the material of the core bar is not particularly limited to this material.

The resin such as the rubber can be employed as the material of the coated elastic body. It is preferable that the coated elastic body should have HsA from 40 to 70. Also, HsA should be set higher if the web carrying speed is high. If the above structure of the present invention is employed, since the paster roller is formed like the substantially crown shape, the center portion of the paster roller in the axial direction can push against the web when the paster roller is bent as above, so that the paster roller can push against the web of the old roller substantially uniformly over the entire range in the axial direction. Therefore, even if the paster roller is pushed against the web of the old roller, both end portions of the pushing portion in the axial direction never hit strongly against the web of the old roller and thus the cutting of the web can be prevented without fail. Further, even if the paster roller is pushed against the web by the weak force that cannot joint the webs in the related art, the webs can be jointed satisfactorily. In other words, since the force for pushing the paster roller against the web can be transmitted substantially uniformly to the entire range in the axial

direction, the extra force to correct the unevenness of the pushing force due to the bending of the paster roller is not needed, and thus the webs can be satisfactorily jointed. In this manner, the improvement of the productivity can be achieved.

In this case, the advantages of the present invention become more remarkable if the web is thinner. The web-cutting preventing effect of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, particularly 7 μm or less.

The web supplying system into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which an old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which a new roller is installed, and a paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and the paster roller is formed like the crown shape. The web supplying system can joint the rear end of the web of the old roller and the top end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

BRIEF DESCRIPTION OF THE DRAWIGS

FIG.1 is a conceptual view showing a web supplying system to which an embodiment of the present invention is applied;

FIG.2 is a partial sectional view showing an embodiment of the present invention;

FIG.3 is a schematic view showing another embodiment of the present invention;

FIG.4 is a schematic view showing another embodiment of the present invention;

FIG.5 is a schematic view showing another embodiment of the present invention; and

FIG.6 is a schematic view showing another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will be explained in detail with reference to the drawings hereinafter. FIG.1 is a schematic view of a web supplying system 10 for the magnetic recording medium, into which a paster roller 20 as an embodiment of the present invention is installed. As a web roller for the magnetic recording medium (new roller), such a web roller is employed that, for example, an outermost peripheral diameter is 500 mm, a web width is 1000 mm, a length of rolled web is 8000 m, and a web thickness is 10 μm or less. It is of course that there is no limit in these dimensions.

In this web supplying system 10, an old roller 1a and

a new roller 1b are fitted to top ends of the three-axle turret arm 11 that is rotatably supported. The turret arm 11 is not limited to the three axle type, and the two axle type, etc. may be employed. An adhesive tape 2 such as the double-faced adhesive tape is provided to the outermost peripheral end portion of the web of the new roller 1b. A sensor 13 for sensing the position of the adhesive tape 2 is provided in vicinity of the new roller 1b. Also, the paster roller 20 is provided in vicinity of the new roller 1b. The web of the old roller 1a is passed between an outer peripheral surface of the new roller 1b and an outer peripheral surface of the paster roller 20. Both the outer peripheral surface of the new roller 1b and the outer peripheral surface of the paster roller 20 do not come into contact with the web of the old roller 1a.

When a remaining amount of the web on the old roller 1a is reduced, the new roller 1b is rotated at the similar speed to the old roller 1a. Then, while sensing the position of the adhesive tape 2 by the sensor 13, the web of the old roller 1a is pushed against the adhesive tape 2 on the outer peripheral surface of the new roller 1b at a predetermined timing by the paster roller 20. The paster roller 20 is driven by the cylinder actuator, or the like. At this time, in the related art, there are the anxiety that the web of the old roller 1a cannot be pushed uniformly against the adhesive tape 2 on the outer peripheral surface of the new roller 1b or the anxiety

that the web is cut off. Nevertheless, in this web supplying system 10, such anxiety can be eliminated since the paster roller 20 described later is employed.

As shown in FIG.2, the paster roller 20 has an substantially cylindrical core bar 21 made of aluminum, and a rubber (HsA in the range from 40 to 70) 22 provided to an outer peripheral surface of the core bar 21. Then, a spiral groove 25 serving as an air exhausting concave portion is provided in the substantially overall area of the outer peripheral surface of the rubber 22, i.e., the outer peripheral surface of the paster roller 20 in the axial direction.

A journal 23 is provided to both end portions that are projected from both ends of the rubber 22 on the core bar 21. The journal 23 is rotatably supported by a bearing 28.

As shown in the enlarged portion in FIG.2, the groove 25 has an substantially semi-circular shape in section. A groove pitch is set to 1 to 10 mm. A groove depth D is set to 0.1 to 1 mm. This groove 25 can be formed by one grooving operation by using the cutting tool, the turning tool, etc. Also, this groove 25 is easily cleaned.

For example, an axial dimension L of the rubber 22 can be set to 1200 mm that is slightly larger than the web width. Of course, this dimension is not particularly limited. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is

because, if the roller end portion hits on the product surface of the old roller, it is possible that the portion becomes no good.

If the above paster roller 20 is moved toward the web of the old roller 1a shown in FIG.1 by the air cylinder, etc., the air between the paster roller 20 and the web of the old roller 1a can be exhausted smoothly from the groove 25 on the outer peripheral surface of the paster roller 20. Therefore, the web of the old roller 1a can be pushed uniformly against the adhesive tape 2 on the outer peripheral surface of the new roller 1b by the paster roller 20. The paster roller 20 is rotated together with the rotation of the new roller 1b when it is brought into contact with the outer peripheral surface of the new roller 1b via the web of the old roller 1a. At this time, since the groove 25 is formed spirally, the groove position at the contact surface between the paster roller 20 and the web of the old roller 1a (the position at which the web of the old roller 1a is not pushed by the paster roller 20) is shifted with the rotation of the paster roller 20 in the axial direction of the paster roller. For this reason, the web of the old roller 1a can be pushed substantially uniformly by the paster roller 20 to leave no space.

According to the present structure, even if the web carrying speed is large, the rear end of the old roller 1a and the top end of the new roller 1b can be jointed without fail.

The improvement of the productivity can be achieved by such web supplying system 10.

FIGs.3A to 3D are a schematic view showing paster rollers 30, 40, 50, 60 as another embodiment of the present invention respectively.

In a paster roller 30 shown in FIG.3A, differently-directed spiral grooves 35a, 35b are provided on one side area and the other side area with respect to the center portion of the outer peripheral surface of a rubber 32 in the axial direction respectively. The grooves 35a, 35b are, so to speak, line symmetry. According to the paster roller 30 in which such bilaterally symmetrical grooves 35a, 35b are provided, the first web and the second web can be pushed uniformly.

In a paster roller 40 shown in FIG.3B, a plurality of ring-like grooves 45 are provided at an equal distance to extend the overall area of the outer peripheral surface of a rubber 42 in the axial direction. According to the paster roller 40 in which such grooves 45 are provided, the first web and the second web can be pushed uniformly.

In a paster roller 50 shown in FIG.3C, a plurality of slits 55 as the concave portion are provided at a distance to predetermined locations of a rubber 52 in the axial direction. A core bar 51 may be exposed from the locations at which the slits 55 are provided. According to the paster roller 50 in which such slits 55 are provided, the web can be adapted itself

to the outer peripheral shape of the new roller and thus the first web and the second web can be pushed uniformly.

In a paster roller 60 shown in FIG.3D, a very large number of dimples 65 are provided over the entire area of the outer peripheral surface of a rubber 62 in the axial direction. According to the paster roller 50 in which such dimples 65 are provided, the first web and the second web can be pushed uniformly. Also, the dimples 65 may be formed to be connected mutually.

FIG.4 shows a paster roller as still another embodiment of the present invention. As shown in FIG.4, a paster roller 120 has the substantially cylindrical core bar 21 made of aluminum, and a rubber (HsA in the range from 40 to 70) 122 as a coated elastic body provided to the outer peripheral surface of the core bar 21. A diameter D3 of the outer peripheral surface of the core bar 21 is uniform. The journal 23 is provided to both end portions that are projected from both ends of the rubber 122 on the core bar 21. The journal 23 is rotatably supported by the bearing 28. The outer peripheral surface of the rubber 122 consists of a cylindrical surface portion 122a, that is located in the center portion in the axial direction and has a outer peripheral diameter D1, and chamfered portions 122b, that are positioned adjacent to both end portions of the cylindrical surface portion 122a in the axial direction and are inclined at a predetermined

inclination angle. In order to illustrate the position at which the chamfered portions 122b are formed, the situation that the web W contacts to the outer peripheral surface of the cylindrical surface portion 122a of the rubber 122 is shown by a chain double-dashed line.

One end portion of the web W (left side in FIG.4) in the width direction and the rubber 122 that contacts to the area near the end portion are shown in detail in the enlarged portion in FIG.4. The chamfered portion 122b is chamfered at an inclination angle θ from a connected portion C1 that is separated by a distance d from the end portion of the web W in the width direction to the inner direction of the web (rightward direction in the enlarged portion in FIG.4), when the web W is brought into contact with the outer peripheral surface of the cylindrical surface portion 122a. That is, the outer peripheral surface of the chamfered portion 122b is inclined rather than the outer peripheral surface of the cylindrical surface portion 122a to the core bar 21 side.

For example, the conditions that the dimension L of the rubber 122 in the axial direction is 1100 mm, the diameter D1 of the outer peripheral surface of the cylindrical surface portion 122a of the rubber 122 is 100 mm, the diameter D3 of the outer peripheral surface of the core bar 21 is 80 mm, the distance d from the end portion of the web to a starting point of the chamfered portion 122b is 50 mm, and the inclination

angle θ of the chamfered portion 122b is 10° may be employed. But it is of course that there is no limitation of the dimension. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is because, if both end portions of the paster roller hit on the product surface of the old roller, it is possible that the portion becomes No Good. Also, it is preferable that the connected portion C1 of the outer peripheral surfaces of the cylindrical surface portion 122a and the chamfered portion 122b should be constructed not to form the edge.

According to the paster roller 120 described above, both end portions of the paster roller 120, that hit strongly onto the web W when the web W is pushed, in the axial direction, are formed as the chamfered portion 122b. Therefore, the pushing force acting to both end portions of the web W in the width direction can be reduced, and thus the web W can be pushed by the substantially uniform pushing force over the overall area of the web W in the width direction. As a result, even if this paster roller 120 is pushed against the web of the old roller, both end portions are never strongly brought into contact with the web of the old roller, and thus the cutting of the web can be prevented without fail. In this manner, the improvement of the productivity can be achieved.

FIG.5 shows a paster roller 130 as yet still another embodiment of the present invention. The paster roller 130

has the substantially cylindrical core bar 21 made of aluminum, and a rubber (HsA in the range from 40 to 70) 132 as a coated elastic body provided to the outer peripheral surface of the core bar 21. The rubber 132 consists of a cylindrical surface portion 132a having an outer peripheral diameter D1, and gently-curved chamfered portions 132b positioned adjacent to both end portions of the cylindrical surface portion 132a in the axial direction. Connected portions C2 between the cylindrical surface portion 132a and the chamfered portions 132b are connected smoothly not to form edges on the outer peripheral surface.

Since no edge is formed on the outer peripheral surface of the rubber 132 in the paster roller 130 constructed as above, the pressure is never partially concentrated to the web when the paster roller 130 is installed into the above web supplying system 10 (see FIG.1) and is pushed against the web. Accordingly, the cutting of the web can be prevented firmly.

In this case, other structures and operations not explained herein are similar to the above embodiment shown in FIG. 4.

FIG.6 shows a paster roller as yet still another embodiment of the present invention. As shown in FIG.6, a paster roller 220 has the substantially cylindrical core bar 21 made of aluminum, and a rubber (HsA in the range from 40 to 70) 222 as the coated elastic body provided to the outer

peripheral surface of the core bar 21. Then, the diameter D1 of the outer peripheral surface of the rubber 222 in the center portion in the axial direction is formed larger than a diameter D2 of the outer peripheral surface in both end portions in the axial direction. In more detail, the rubber 222 has a crown shape in which the diameter D1 of the outer peripheral surface in the center portion in the axial direction becomes maximum. That is, the diameter of the outer peripheral surface of the rubber 222 is gradually increased from both end portions to the center portion in the axial direction. Then, the outer peripheral surface is smoothly connected in the center portion in the axial direction, so that no edge is formed at the connected portion on the outer peripheral surface.

The diameter D3 of the outer peripheral surface of the core bar 21 is uniform. The journal 23 is provided to both end portions that are projected from both ends of the rubber 222 on the core bar 21. The journal 23 is rotatably supported by the bearing 28.

For example, the conditions that the dimension L of the rubber 222 in the axial direction is 1100 mm, the diameter D1 of the outer peripheral surface of the center portion the rubber 222 in the axial direction is 100 mm, the diameter D2 of the outer peripheral surface of both end portions of the rubber 222 in the axial direction is 98.5 mm, and the diameter D3 of the outer peripheral surface of the core bar 21 is 80 mm may

be employed. But it is of course that there is no limitation of the dimension. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is because, if both end portions of the paster roller hit on the product surface of the old roller, it is possible that the portion becomes No Good.

Since the outer peripheral shape of the rubber 222 is formed like the crown shape in the mentioned-above paster roller 220, the center portion of the rubber 222 in the axial direction can push against the web when the paster roller 220 is bent, so that the rubber 222 can push against the web of the old roller 1a (see FIG.1) substantially uniformly over the entire area of the rubber 222 in the axial direction. As a result, if the paster roller 220 is pushed against the web of the old roller 1a, both end portions of the rubber 222 in the axial direction never strongly contact to the web of the old roller 1a, whereby the web cutting can be prevented without fail. In addition, even when the paster roller 220 is pushed against the web by the weak force by which the webs cannot be jointed in the related art, the webs can be jointed satisfactorily. That is, because the force for pushing the paster roller 220 against the web can be transmitted substantially uniformly to the overall area of the rubber 222 in the axial direction, there is no need that the extra force should be applied to correct the unevenness of the pushing force

because of the bending of the paster roller 220, and thus the webs can be jointed satisfactorily. In this manner, the improvement of the productivity can be achieved.

The present invention is not limited to above embodiments, and appropriate variation, improvement, etc. may be applied. The above embodiments may be combined together.

For example, the air exhausting effect may be accelerated by applying the chemical surface process to the outer peripheral surface of the paster roller.

For example, the inner peripheral surface of the hollow cylindrical core bar may be supported by the reinforcing member. Also, the rubber may be formed integrally with the member constituting the core bar 21.

[Examples]

(Test 1)

The web roller on which the web made of PET (polyethylene terephthalate) film, whose web width is 1000 mm and whose web thickness is 6 μm, is rolled. On the outer peripheral surface of the web roller, the ultra-low pressure prescale is rolled was fitted to the web supplying system 10 as the new roller 1b shown in FIG.1. Also, the same web roller on which the prescale is not rolled was fitted as the old roller 1a, and then the web was supplied by the feeding tension of 100 N/m at the speed of 200 m/min.

In addition, as the paster roller, there were prepared

two type paster rollers in which, in the paster roller 120 shown in FIG.4, the dimension L of the rubber 122 in the width direction is set to 1100 mm, the hardness of the rubber 122 is set to HsA 60, the diameter D3 of the outer peripheral surface of the core bar 21 is set to 80 mm, and the distance d from the end portion of the web to the connected portion between the cylindrical surface portion and the chamfered portion is 50 mm, but the inclination angle of the chamfered portion is changed.

Out of two type paster rollers, the paster roller having the inclination angle θ of 10° was set as Example 1 and the paster roller having the inclination angle θ of 5° was set as Example 2.

The paster roller of Example 1 or Example 2 was installed into the above web supplying system, and then the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller or the cylinder pressure was measured while pushing the paster roller against the new roller via the web supplied from the old roller respectively and also the web on the old roller was watched and evaluated.

At this time, by way of comparison, the similar watch and evaluation were executed by using the paster roller that has the conventional cylindrical outer peripheral surface in which the chamfered portion is not formed.

In the test using the paster roller of Example 1, by

setting the cylinder pressure acting to the paster roller to 300 kPa, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured. Also the web of the old roller was watched. The case where the conventional paster roller shown as Comparative Example 1 is employed was watched under the similar condition (the cylinder pressure 300 kPa).

In addition, in the test using the paster roller of Example 2, as the condition not to cause the cutting of the web, the cylinder pressure to provide the maximum value 980 kPa of the pushing pressure acting to the outer peripheral surface of the new roller and the minimum value of the pushing pressure were measured, and also the jointed state between the web of the old roller and the web of the new roller was watched. Also, as to the conventional paster roller shown as Comparative Example 2, the similar watching was executed at the maximum value of the pushing pressure to 980 kPa.

Results of the above evaluation test are given in Table 1.

Table 1

	Example 1	Comparative Example 1	Example 2	Comparative Example 2
Inclination angle (degree)	10	0	5	0
Cylinder pressure (kPa)	300	300	200	100
Pushing pressure MAX (kPa)	1180	2350	980	980
Pushing pressure MIN (kPa)	880	880	680	490
Pushing pressure MAX-MIN (kPa)	300	1470	300	490
Situation	Good	Cut	Good	Adhesive peeling off
Evaluation	Good	No Good	Good	No Good

As shown in Table 1, according to the paster roller shown in Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 1180 kPa, the minimum value was 880 kPa, and the difference between them was 300 kPa. Then, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller became minimum in the center portion of the paster roller in the width direction, and was increased toward both ends in the axial direction, and became maximum at both end portions in the axial direction. Also, the cutting of the web supplied from the old roller did not appear.

In contrast, according to the paster roller shown in

Comparative Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 2350 kPa, the minimum value was 880 kPa. The difference between the maximum value and the minimum value was 1470 kPa, and the cutting of the web supplied from the old roller appeared. In this case, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller was similar to Example 1.

Based on the results described above, according to the paster roller shown in Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was reduced to 1170 kPa in contrast to 2350 kPa of the paster roller in the related art. Therefore, according to Example 1, the pushing pressure to the end portions of the web in the width direction could be reduced and thus the web was never cut. In addition, according to this Example 1, the difference between the maximum value and the minimum value of the pushing pressure could be reduced to 300 kPa in contrast to 1470 kPa of the paster roller in the related art. Therefore, according to Example 1, since the pushing pressure to the end portions of the web in the width direction was reduced, the pushing pressure acting to the web in the width direction became substantially uniform and thus the web of the old roller and the web of the new roller could be satisfactorily jointed without the cutting of the web.

Also, as shown in Table 1, according to the paster roller shown in Example 2, the cylinder pressure was 200 kPa, the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller was 680 kPa, and the web of the old roller and the web of the new roller could be satisfactorily jointed. The distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 1.

In contrast, according to the paster roller shown in Comparative Example 2, the cylinder pressure was 100 kPa, the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller was 490 kPa, and the web of the new roller could not be satisfactorily jointed to the web of the old roller. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 1.

Based on the results described above, according to the paster roller shown in Example 2, the cylinder pressure could be increased two times rather than Comparative Example 2 and the minimum value of the pushing pressure could be increased without the increase of the maximum value of the pushing pressure. Therefore, since the difference between the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller could be reduced to 300 kPa in contrast to 490 kPa in Comparative Example 2,

the force for pushing the paster roller 20 against the web could be transmitted substantially uniformly to the overall area of the rubber 122 in the axial direction. As a result, even if the cylinder pressure was increased to correct the unevenness of the pushing force due to the bending of the paster roller, the web of the old roller and the web of the new roller could be jointed satisfactorily without the increase of the maximum value of the pushing pressure.

(Test 2)

The web roller on which the web made of PET film, whose web width is 1000 mm and whose web thickness is 6 μm, is rolled. On the outer peripheral surface of the web roller, the ultra-low pressure prescale is rolled. The web roller was installed into the web supplying system 10 as the new roller 1b shown in FIG.1. Also, the same web roller on which the prescale is not rolled was installed as the old roller 1a, and then the web was supplied by the feeding tension of 98 N/m at the speed of 200 m/min.

In addition, as the paster roller, there were prepared two type paster rollers in which, in the paster roller 220 shown in FIG.6, the dimension L of the rubber 222 in the width direction is set to 1100 mm, the hardness of the rubber 222 is set to HsA of 60, the diameter D3 of the outer peripheral surface of the core bar 21 is set to 80 mm, and the crown is changed.

Any one of two type paster rollers, the one paster roller

in which the crown is 1.5 mm (the maximum outer peripheral diameter D1: ϕ 100 mm, and the minimum outer peripheral diameter D2: ϕ 98.5 mm) was set as Example 3, and the other paster roller in which the crown is 0.5 mm (the maximum outer peripheral diameter D1: ϕ 100 mm, and the minimum outer peripheral diameter D2: ϕ 99.5 mm) was set as Example 4.

The paster roller of Example 3 or Example 4 was installed into the above web supplying system, and then the pushing pressure of the paster roller acting onto the outer peripheral surface of the new roller was measured while pushing the paster roller against the new roller via the web supplied from the old roller respectively and also the web on the old roller was watched and evaluated.

At this time, by way of comparison, the similar watching and evaluation were executed by using the paster roller that has the conventional cylindrical outer peripheral surface.

In the test using the paster roller of Example 3, by setting the cylinder pressure acting to the paster roller to 294 kPa, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured. Then, the web of the old roller was watched. Also, the case where the conventional paster roller shown as Comparative Example 3 is employed was watched under the similar condition (the cylinder pressure 294 kPa).

In addition, in the test using the paster roller of

Example 4, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured by setting the cylinder pressure to 196 kPa. The jointed state between the web of the old roller and the web of the new roller was watched. Also, as to the conventional paster roller shown as Comparative Example 4, the similar watching was executed at the same cylinder pressure.

Results of the above evaluation test are given in Table 2.

Table 2

	Example 3	Comparative Example 3	Example 4	Comparative Example 4
Crown	1.5	0	0.5	0
Cylinder pressure (kPa)	294	294	196	196
Pushing pressure MAX (kPa)	980	1470	880	980
Pushing pressure MIN (kPa)	880	780	680	490
Pushing pressure MAX-MIN (kPa)	100	690	200	490
Situation	Good	Cut	Good	Adhesive peeling off
Evaluation	Good	No Good	Good	No Good

As shown in Table 2, according to the paster roller shown in Example 3, the maximum value of the pushing pressure acting

to the outer peripheral surface of the new roller was 980 kPa, the minimum value was 880 kPa, and the difference between them was 100 kPa. Then, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller became minimum in the center portion of the paster roller in the width direction, and was increased toward both ends in the axial direction, and became maximum at both end portions in the axial direction. Also, the cutting of the web supplied from the old roller did not appear.

In contrast, according to the paster roller shown in Comparative Example 3, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 1470 kPa, the minimum value was 780 kPa, the difference between the maximum value and the minimum value was 690 kPa, and the cutting of the web supplied from the old roller appeared. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

Based on the results described above, according to the paster roller shown in Example 3, the difference between the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller could be reduced to 100 kPa in contrast to 690 kPa of the paster roller in the related art. Therefore, according to Example 3, the pushing pressure acting to the web in the width direction became

substantially uniform, and thus the web of the old roller and the web of the new roller could be satisfactorily jointed without the cutting of the web.

Also, as shown in Table 2, according to the paster roller shown in Example 4, the cylinder pressure was 200 kPa, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 880 kPa, the minimum value was 680 kPa, and the difference between them was 200 kPa. The web of the old roller and the web of the new roller could be satisfactorily jointed. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

In contrast, according to the paster roller shown in Comparative Example 4, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 980 kPa, the minimum value was 490 kPa, and the difference between the maximum value and the minimum value was 490 kPa. The web of the new roller could not be jointed satisfactorily to the web of the old roller. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

Based on the results described above, according to the paster roller shown in Example 4, the difference between the maximum value and the minimum value of the pushing pressure

acting to the outer peripheral surface of the new roller could be reduced to 200 kPa in contrast to 490 kPa in Comparative Example 4. Therefore, the force for pushing the paster roller 20 against the web could be transmitted substantially uniformly to the overall area of the rubber 22 in the axial direction. As a result, the application of the extra force to correct the unevenness of the pushing force due to the bending of the paster roller 20 was not needed, and also the web of the old roller and the web of the new roller could be satisfactorily jointed by the small pushing pressure.

As described above, according to the present invention, the paster roller that is capable of pushing the second web against the first web firmly and preventing the web cutting to contribute the improvement of the productivity can be provided.

While only certain embodiments of the invention have been specifically described herein, it will apparent that numerous modifications may be made thereto without departing from the spirit and scope of the invention.